

Molar Volume, Density, and Molar Mass Determinations from STP

How many liters does 2.34 mol of butane occupy at STP?

How many mol of oxygen do you have if you have 130ml of oxygen at STP?

How many grams of carbon dioxide do you have if you have 2.4×10^4 ml of it at STP?

What is the density of NH_3 at STP in g/L?

What is the density of C_4H_{10} at STP in g/L?

What is the molar mass of a gas with a density of 2.59 g/L? Is this gas propane or butane? (molar masses are 44.1 and 58.1 g/mol, respectively)

A 1.25 g sample of the gaseous product of a chemical reaction was found to have a volume of 350. ml at 20.0°C and 750. mm Hg. What is the molar mass of this gas? (Hint remember the gas laws)

The Ideal Gas Law

Section Review 12.2

DIRECTIONS: Write on the line at the right of each statement the letter preceding the word or expression that best completes the statement.

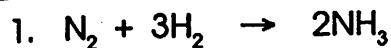
1. Common units for the gas constant R are (a) $\text{L} \cdot \text{atm}$; (b) $\text{mol} \cdot \text{K}$; (c) $(\text{L} \cdot \text{atm})/(\text{mol} \cdot \text{K})$; (d) atm/K . _____ 1
2. The ideal gas law combines Boyle's law, Charles' law, and (a) Graham's law; (b) Avogadro's principle; (c) Gay-Lussac's law of combining volumes; (d) Dalton's principle. _____ 2
3. The value of R , the ideal gas constant, can be calculated from measured values of a gas's pressure, volume, temperature, and (a) molar amount; (b) chemical formula; (c) rate of diffusion; (d) density. _____ 3
4. All of the following equations are statements of the ideal gas law except (a) $P = nRT/V$; (b) $(PV)/T = nR$; (c) $P/n = (RT)/V$; (d) $R = (PV)/(nT)$. _____ 4
5. To use the ideal gas law to determine the molar mass of a gas (a) the mass of a molar volume of the gas must be determined; (b) the mass of any known volume of the gas may be used; (c) a volume of less than 22.4 may not be used; (d) the volume measurement must be made at STP. _____ 5
6. If n and T are constant, the ideal gas law reduces to (a) Charles' law; (b) Boyle's law; (c) Avogadro's principle; (d) zero. _____ 6
7. If n and P are constant, the ideal gas law reduces to (a) Charles' law; (b) Boyle's law; (c) Avogadro's principle; (d) zero. _____ 7
8. If P and T are constant, the ideal gas law reduces to (a) Charles' law; (b) Boyle's law; (c) Avogadro's principle; (d) zero. _____ 8

DIRECTIONS: Write the answer to questions 9–15 on the line to the right, and show your work in the space provided.

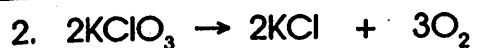
9. Calculate the volume occupied by 12.0 g of carbon dioxide (CO_2 , 44 g/mol) at 20.0°C and 740 mm Hg. _____ 9
10. What is the mass of chlorine gas (Cl_2 , 70.9 g/mol) contained in a 5.00 L flask at 27°C and 720 mm Hg? _____ 10
11. Calculate the approximate volume of a 0.60 mol sample of gas at 15°C and a pressure of 1.1 atm. _____ 11
12. What is the approximate pressure exerted by 1.2 mol of a gas with a temperature of 20°C and a volume of 9.5 L? _____ 12
13. A gas sample, mass 0.467 g, is collected at 20°C and 732.5 mm Hg. The volume is 200. mL. What is the molar mass of the gas? _____ 13
14. A gas sample, mass 0.686 g, is collected at 20°C and 722.5 mm Hg. Its volume is 350 mL. What is the molar mass of the gas? _____ 14
15. A gas sample, mass 2.50 g, is collected at 20.0°C and 732.5 mm Hg. Its volume is 1.28 L. What is the molar mass of the gas? _____ 15

STOICHIOMETRY: MIXED PROBLEMS

Name _____



What volume of NH_3 at STP is produced if 25.0 g of N_2 is reacted with an excess of H_2 ?



If 5.0 g of KClO_3 is decomposed, what volume of O_2 is produced at STP?

3. How many grams of KCl are produced in Problem 2?



What volume of hydrogen at STP is produced when 2.5 g of zinc react with an excess of hydrochloric acid?



How many liters of water are produced if 2.0 g of sodium sulfate are produced in the above reaction at 745 torr and 25.0°C?



If 10.0 g of aluminum chloride are decomposed, how many liters of Cl_2 are produced at 1.23 atm and 12.0°C?
